

DESCRIPTIONS OF SOME STRONGYLES (NEMATODA) FROM MAMMALS IN EAST NEPAL: WITH RECORDS OF OTHER PARASITIC NEMATODES

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INTRODUCTION

ALTHOUGH the main zoological interest of the British Museum (Natural History) East Nepal Expedition: 1961-62 was in soil inhabiting invertebrates (Sheals & Inglis, 1965) the opportunity was taken, when possible, to collect helminth parasites. Among the nematodes collected are several new or rare species of Strongylinina, which are described below, together with a list of the other species which were collected. Two new, non-strongyle species have been described elsewhere (Inglis & Ogden, 1965, 1965a).

List of All Species Collected

All host identifications were carried out by the staff of the British Museum (Natural History).

Felis bengalensis horsfieldi Gray, 1842. ♂. Hatia (27° 44' N., 87° 21' E.), Arun River, East Nepal. (22.xii.1961; 7,000 feet alt.).

Toxocara mystax (Zeder, 1800) ex small intestine.

Mastophorus muris (Gmelin, 1790) ex stomach.

Molineus (?) *patens* (Dujardin, 1845) ex stomach.

Molineus springsmithi sp. nov. ex small intestine.

Arthrostoma felineum Cameron, 1927 ex small intestine.

Arthrostoma tunkanati sp. nov. ex small intestine.

Callosciurus pygerythrus lokroides Hodgson, 1836. ♂. Popti La (27° 47' N., 87° 21' E.), Arun River, East Nepal. (22.xii.1961; 9,600 feet alt.)

Mastophorus sp. (♀♀ only) ex small intestine.

Rictularia dhanra Inglis & Ogden, 1965 ex intestine.

Brevistriata (?) *skrjabini* (Schulz & Lubimov, 1932) ex small intestine.

Longistriata gola sp. nov. ex small intestine.

Callosciurus maccllellandi maccllellandi Horsfield, 1839. ♀. Hatia (27° 44' N., 87° 21' E.), Arun River, East Nepal. (17.xii.1961; 7,500 feet alt.)

Citellina himalensis Inglis & Ogden, 1965 ex small intestine.

Brevistriata (?) *skrjabini* (Schulz & Lubimov, 1932) ex small intestine.

Longistriata (?) *gola* (♀♀, only) ex small intestine.

Suncus murinus caerulescens Shaw, 1800. ♀. Sanghu (27° 21' N., 87° 33' E.), Maewa Khola, East Nepal. (25.xi.1961; 6,500 feet alt.)

Capillaria minuta Chen, 1937 ex stomach.

Rattus rattus sikkimensis Hinton, 1919. juv. ♂. Sanghu (as above). (17.x.1961).

Nippostrongylus brasiliensis (Travassos, 1914) ex small intestine.

Rattus r. sikkimensis ♂. At same locality (6.xi.1961).

Nippostrongylus brasiliensis ex small intestine.

Rattus r. sikkimensis ♂. At same locality.

Heterakis spumosa (Schneider, 1866) ex caecum.

Rattus r. sikkimensis ♀. At same locality (21.x.1961).

Nippostrongylus brasiliensis ex small intestine.

Mastophorus muris ex stomach.

Heterakis spumosa ex intestine and caecum.

Rattus r. sikkimensis unsexed, at same locality (6.i.1962).

Heterakis spumosa ex caecum.

In addition two *Suncus m. caerulescens* and six *Rattus r. sikkimensis*, all caught at Sanghu between 7.xi.1961 and 5.iii.1962, were searched without finding any parasites.

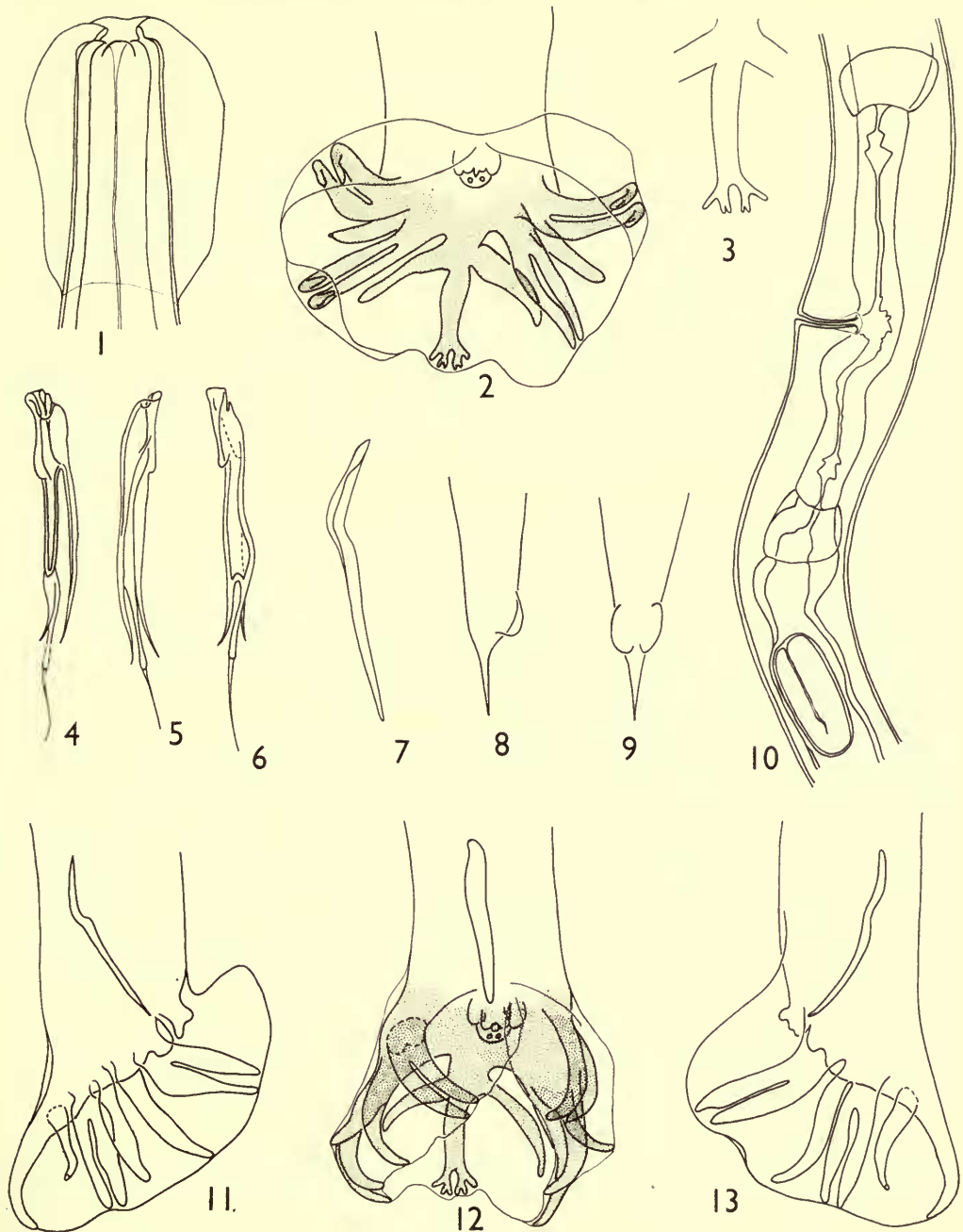
Descriptive Section

Molineus (?) *patens* (Dujardin, 1845)

MATERIAL STUDIED. 7 ♂, 3 ♀ ex stomach *Felis bengalensis horsfieldi*. Hatia, Arun River, East Nepal. B.M. (N.H.), Reg. Nos. 1965. 1-5.

MEASUREMENTS (in mm.). Males: Body length: 2.56; 2.64; 2.68; 2.78; 2.87; 2.91; 3.34. Body breadth: 0.053; 0.053; 0.055; 0.050; 0.051; 0.055; 0.054. Diameter of head: 0.022; 0.020; 0.017; 0.022; 0.022; 0.019; 0.023. Diameter of cephalic vesicle: 0.038; 0.030; 0.030; 0.034; 0.035; 0.031; 0.036. Length of cephalic vesicle: 0.060; 0.053; 0.054; 0.047; 0.051; 0.056; 0.054. Distance of cervical groove from anterior end of body: 0.153; 0.177; 0.159; 0.158; 0.188; 0.183; 0.177. Oesophagus length: 0.348; 0.347; 0.352; 0.366; 0.358; 0.298; 0.398. Length of spicules: 0.099; 0.107; 0.089; 0.100; 0.090; 0.103; 0.105. Length of gubernaculum: 0.051; 0.058; 0.047; 0.060; 0.046; 0.059; 0.064.

Females: Body length: 3.03; 3.55; 3.62. Body breadth: 0.063; 0.050; 0.072. Diameter of head: 0.023; 0.020; 0.022. Diameter of cephalic vesicle: 0.040; 0.030; 0.043. Length of cephalic vesicle: 0.056; 0.044; 0.060. Distance of cervical groove from anterior end of body: 0.160; 0.154; 0.201. Oesophagus length: 0.378; 0.316; 0.420. Length of tail: 0.064; 0.056; 0.068. Distance of vulva from posterior end of body: 0.588; 0.568; 0.622. Size of eggs: 0.054 × 0.027 to 0.075 × 0.031.



FIGS. 1-13. *Molineus (?) patens*. Fig. 1. Dorsal view of head showing the cephalic vesicle. Fig. 2. Ventral view of male bursa. Fig. 3. Detail of dorsal ray. Fig. 4. Spicule from the left. Fig. 5. Spicule from the right. Fig. 6. Dorso-lateral view of spicule. Fig. 7. Lateral view of gubernaculum. Fig. 8. Terminal region of female tail (lateral). Fig. 9. Terminal view of female tail (ventral). Fig. 10. Lateral view of vulvar region. Fig. 11. Lateral view of bursa from right-hand side (teratological). Fig. 12. Ventral view of bursa (teratological). Fig. 13. Lateral view of bursa from left-hand side (teratological).

The head bears the typical cephalic vesicle (Text-fig. 1).

The cuticle is marked by ten to twelve longitudinal ridges and the cervical groove is complete round the body although it is rather faint on the dorsal surface. No cervical papillae have been seen.

Male. The bursa is typical with the ventro-lateral and latero-ventral rays arising from a common base and the postero- and medio-laterals arising from a common base. The antero-lateral (or externo-lateral) ray does not reach the edge of the bursa. The externo-dorsal ray is given off some distance along the dorsal ray, and the latter ray bifurcates terminally twice with the internal small ray further divided just before the edge of the bursa (Text-figs. 2, 3 and 13).

The gubernaculum is fairly simple with a slight kink in its lateral outline (Text-figs. 7, 11 and 13) while the complex spicules are relatively slim and terminate posteriorly in three needle-like points, of which the median, and the longest, splits the spicule for about half its length (Text-figs. 4, 5 and 6). A small genital cone is present which carries two small papilla-like structures on its posterior edge (Text-figs. 2 and 12).

One teratological male is present in which there is an additional ray on the right-hand side of the bursa (Text-figs. 11 and 12) which arises between the typical externo-lateral and the pair of postero- and medio-laterals, and reaches the edge of the bursa (Text-fig. 11). The rays on the left-hand side are typical (Text-fig. 13).

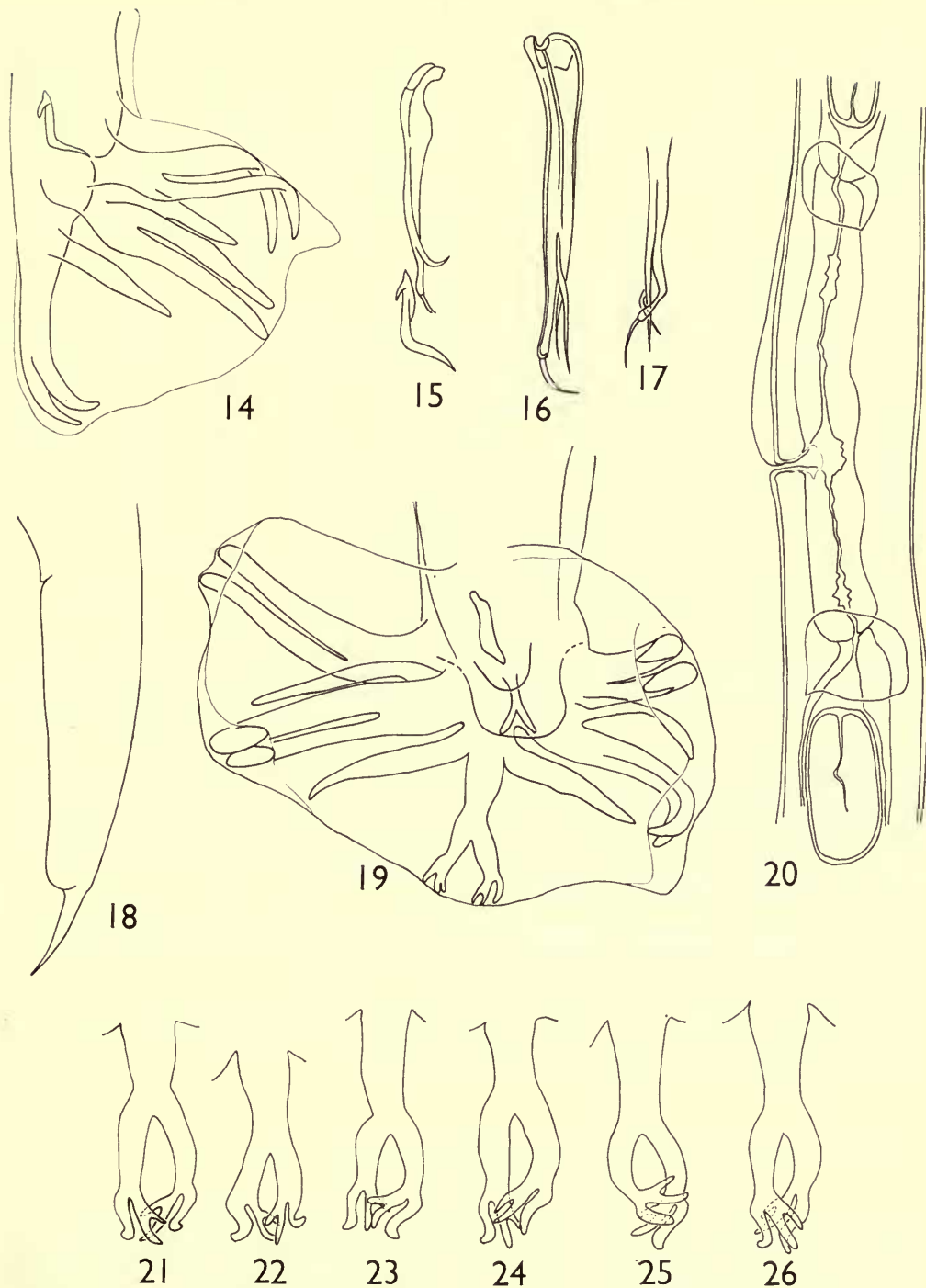
Female. The vulva, uterus and eggs are typical of the genus (Text-fig. 10) while the tail carries a pair of ventro-lateral swellings just anterior to the fine posterior terminal process (Text-figs. 8 and 9).

DISCUSSION. The specimens match the description of *Molineus patens* (Dujardin, 1845) Petrov, 1928 although they are smaller than any previously reported. Additional points of difference appear to be the lack of any small hooks or cuticular bumps on the inner surface of the bursa and the slightly elaborate genital cone. Comparison of the specimens described above with the descriptions of *M. patens* given by Petrov (1928), Zunker (1929), Leiper (1936), Travassos (1937) and Skrjabin *et al.* (1954) shows that the body is only half, the spicules two-thirds and the gubernaculum half the lengths of the corresponding dimensions for the smallest specimens previously recorded. Leiper (1936) observed that there appeared to be a tendency towards a host : parasite size relationship for specimens of *M. patens* recovered from the stoat and weasel in England, but Table 2 in Petrov (1928) shows that there are only slight variations between the measurements of specimens from five different hosts examined in the U.S.S.R.

As the relative proportions of the specimens we described above are in general agreement with those already reported and the structure of the spicules appears to be the same, we treat our specimens as *M. patens*, although with some reservations.

Molineus springsmithi sp. nov.

MATERIAL STUDIED. 6 ♂, 6 ♀ ex small intestine of *Felis bengalensis horsfieldi*. Hatia, Arun River, East Nepal. B.M. (N.H.), Reg. Nos. 1965. 6-25.



FIGS. 14-26. *Molineus springsmithi* sp. nov. Fig. 14. Lateral view of male bursa. Fig. 15. Lateral view of spicule and gubernaculum. Fig. 16. Detail of whole spicule. Fig. 17. Detail of posterior end of spicule. Fig. 18. Lateral view of female tail. Fig. 19. Ventral view of male bursa. Fig. 20. Lateral view of vulvar region of female. Figs. 21-26. Ventral views of dorsal rays showing variation of major bifurcation.

MEASUREMENTS (in mm.). Males. Body length: 2.27; 2.52; 2.63; 2.68; 2.69; 3.01. Body breadth: 0.054; 0.067; 0.044; 0.052; 0.046; 0.072. Diameter of head: 0.021; 0.022; 0.022; 0.022; 0.028; 0.025. Diameter of cephalic vesicle: 0.029; 0.040; 0.030; 0.028; 0.036; 0.033. Length of cephalic vesicle: 0.047; 0.042; 0.044; 0.045; 0.051; 0.044. Oesophagus length: 0.347; 0.353; 0.307; 0.381; 0.340; 0.397. Distance of cervical groove from anterior end of body: 0.125; 0.147; 0.141; 0.144; 0.139; 0.157. Length of spicules: 0.070; 0.065; 0.068; 0.068; 0.062; 0.065. Length of gubernaculum: 0.024; 0.024; 0.025; 0.021; 0.024; 0.021.

Females. Body length: 3.15; 3.52; 3.57; 3.79; 3.94; 3.95. Body breadth: 0.052; 0.057; 0.052; 0.054; 0.062; 0.057. Diameter of head: 0.023; 0.025; 0.024; 0.024; 0.025; 0.024. Diameter of cephalic vesicle: 0.032; 0.031; 0.032; 0.028; 0.033; 0.030. Length of cephalic vesicle: 0.041; 0.057; 0.047; 0.045; 0.046; 0.051. Oesophagus length: 0.298; 0.343; 0.374; 0.360; 0.422; 0.372. Distance of cervical groove from anterior end of body: 0.120; 0.155; 0.173; 0.154; 0.172; 0.172. Distance of vulva from posterior end of body: 0.592; 0.565; 0.522; 0.500; 0.532; 0.543. Length of tail: 0.068; 0.059; 0.048; 0.051; 0.072; 0.058. Size of eggs: 0.055 × 0.026 to 0.071 × 0.031.

The cuticle is marked by eleven to fifteen longitudinal ridges and the cervical groove is distinct completely round the body. No cervical papillae have been seen.

Male. The bursa is typical with the ventro-lateral and latero-ventral and the postero- and medio-lateral rays arising in pairs from common bases. The first bifurcation of the dorsal ray is rather deep while the terminal bifurcations, the inner one double, are somewhat variable (Text-figs. 21-26). The gubernaculum is small and slightly hooked anteriorly (Text-figs. 14-15) and the spicules are simple with three terminal processes. The major division of the processes extends only for about one third the length of the spicules (Text-figs. 15-17). The bursa is not divided into lobes and there is a small pre-cloacal supplementary membrane which is supported by an internal Y-shaped thickening (Text-fig. 19).

Female. The reproductive system is typical (Text-fig. 20) and the tail ends in a small spike (Text-fig. 18).

DISCUSSION. This species is very distinct in the extreme depth of the first bifurcation of the dorsal ray, the characteristic shape of the gubernaculum and the relative simplicity of the spicules.

Brevistrata ? *skrabini* (Schulz & Lubimov, 1932)

MATERIAL STUDIED. 2 ♂, 5 ♀ ex small intestine of *Callosciurus pygerythrus lokroides*. Popti La, Arun River, East Nepal. B.M. (N.H.) 1965. 26-28.

2 ♂, 7 ♀ ex small intestine *Callosciurus maccellelandi maccellelandi*. Hatia, Arun River, East Nepal. B.M. (N.H.) 1965. 29-31.

MEASUREMENTS (in mm.). In two groups separated by full stop. First group from Popti La sample. Males. Body length: 3.31; 3.73. 4.35; 5.32. Body breadth: 0.067; 0.063. 0.116; 0.116. Diameter of head: 0.020; 0.020. 0.028; 0.026. Diameter of cephalic vesicle: 0.030; 0.030. 0.040; 0.036. Length of cephalic vesicle: 0.042; 0.045. 0.046; 0.057. Oesophagus length: 0.347; 0.327. 0.314; 0.388. Length of spicules: 0.450; 0.442. 0.570; 0.548. Length of gubernaculum: 0.040; 0.044. 0.053; 0.060.

Females. Body length: 3.43; 3.98; 4.13; 4.39; 4.59. 4.63; 5.32; 5.33; 5.36; 5.40; 5.45; 5.59. Body breadth: 0.065; 0.065; 0.063; 0.065; 0.072. 0.089; 0.123; 0.109; 0.135; 0.098; 0.098; 0.104. Diameter of head: 0.022; 0.022; 0.023; 0.023; 0.025. 0.025; 0.029; 0.028; 0.025; 0.030; 0.030; 0.028. Diameter of cephalic vesicle: 0.026; 0.028; 0.023; 0.029; 0.027. 0.033; 0.038; 0.040; 0.032; 0.030; 0.030; 0.042. Length of cephalic vesicle: 0.042; 0.048; 0.042; 0.044; 0.044. 0.043; 0.050; 0.048; 0.047; 0.050; 0.048; 0.051. Oesophagus length: 0.300; 0.353; 0.335; 0.338; 0.322. 0.382; 0.436; 0.400; 0.410; 0.388; 0.378; 0.364. Length of tail: 0.049; 0.037; 0.042; 0.042; 0.044. 0.049; 0.049; 0.054; 0.040; 0.057; 0.051; 0.056. Distance of vulva from posterior end of body: 0.085; 0.094; 0.096; 0.093; 0.110. 0.098; 0.115; 0.107; 0.079; 0.112; 0.107; 0.117. Size of eggs: 0.055 × 0.033 to 0.076 × 0.040.

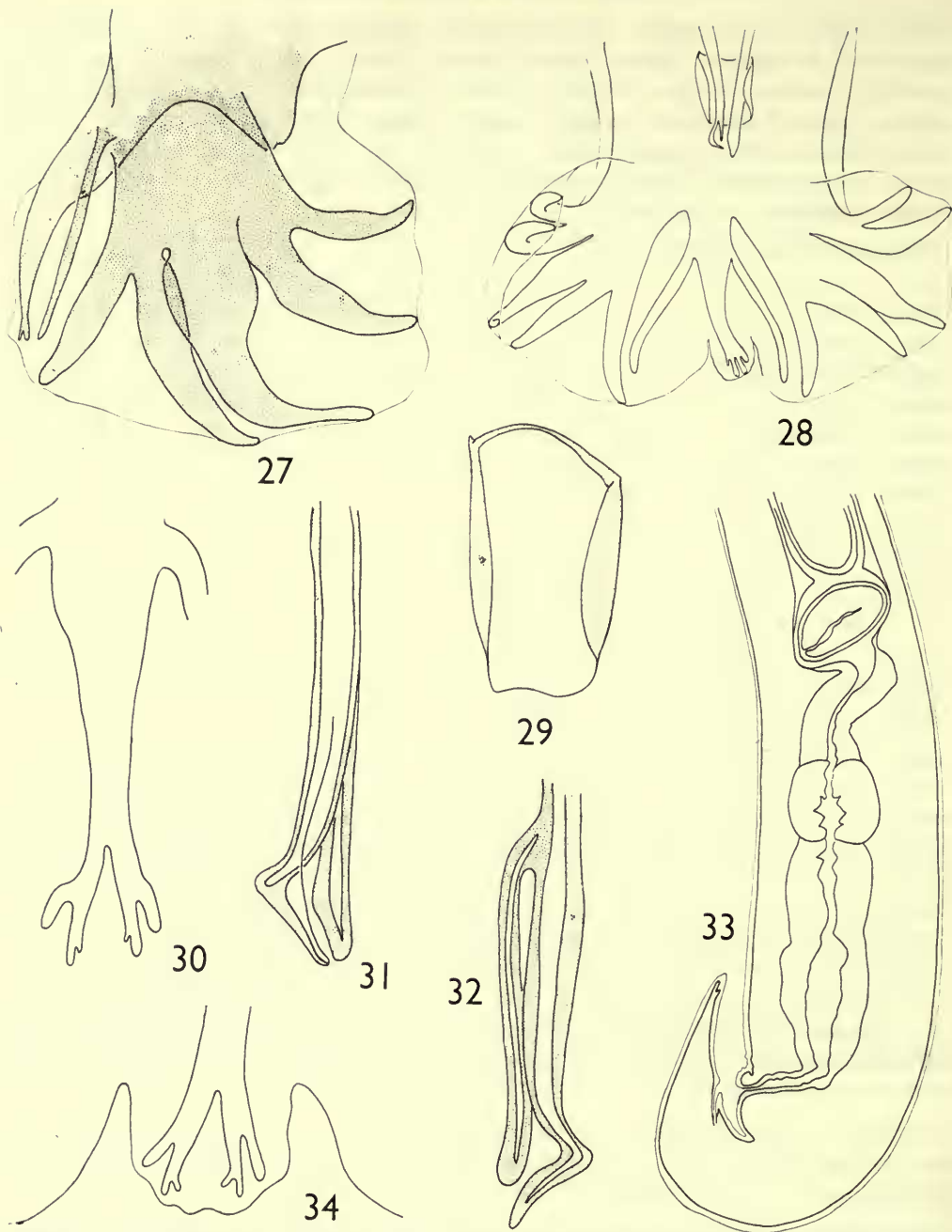
The worms are coiled into spirals with two or three turns. The head carries a small cephalic vesicle and the mouth is simple without any obvious cavity between it and the beginning of the oesophagus. The cuticle bears the typical broken longitudinal ridges which alternate down the body.

Male. The bursa has a small distinct dorsal lobe (Text-fig. 34). The ventral rays of the bursa arise together, as do the three lateral rays (Text-figs. 27 and 28). All these rays reach the edge of the bursa. The lateral rays differ in size with the stout externo- and medio-laterals lying close together, while the postero-lateral is much slimmer and is directed posteriorly away from the other two. The thin externo-dorsal rays arise some distance from the origin of the dorsal ray (Text-fig. 28). The dorsal ray bifurcates twice towards its posterior end with the inner branch of the final bifurcation bearing a further relatively small inner branch (Text-fig. 30).

The spicules are long and filiform with bifurcate posterior ends (Text-figs. 31 and 32). The main terminal branch of the spicules ends in a hook-like projection while the other branch is blunt. The gubernaculum is small and roughly square in outline when viewed from the ventral surface (Text-fig. 29).

Female. The single uterus and ojector open through the vulva which lies very near the anus (Text-fig. 33). The tail is relatively short and conical with the phasmids near the tip.

DISCUSSION. The three species currently referred to the genus *Brevistriata*: *B. skrjabini* (Schulz & Lubimov, 1932), *B. sinensis* Li, 1941 and *B. callosciuri* Supperer & Kutzer, 1963; all occur in Asian squirrels. Supperer & Kutzer (1963) tabulate what they consider to be the diagnostic characters for these three species.



FIGS. 27-34. *Brevistriata skrjabini*. Fig. 27. Lateral view of male bursa. Fig. 28. Ventral view of male bursa. Fig. 29. Ventral view of gubernaculum. Fig. 30. Dorsal ray of bursa. Fig. 31. Ventral view of distal end of spicule from right. Fig. 32. Ventral view of distal end of spicule from left. Fig. 33. Lateral view of female tail showing vulva. Fig. 34. Detail of small dorsal lobe of bursa.

B. sinensis is characterized by extremely long spicules with non-bifurcate posterior ends and by the externo-dorsal rays arising about half-way along the length of the dorsal ray. *B. callosciuri* is unique in the extreme division of the caudal bursa into two distinct lobes, the spicules are bifurcate distally forming two, unequal pointed branches and the gubernaculum is complex.

The specimens described above are, however, in good agreement with the original description of *B. skrjabini* with the exception of the bifurcation of the spicules. Schulz & Lubimov (1932) state that the spicules are bifurcate "near the proximal end", but these structures are not figured and it would appear that "proximal" is an error for "distal". Travassos (1937) and Supperer & Kutzer (1963) state that the spicules are bifurcate distally although they apparently derive their data from the original description. The specimens described above agree with the original description in sufficient detail to warrant their reference, at least provisionally, to *B. skrjabini*.

***Longistriata gola* sp. nov.**

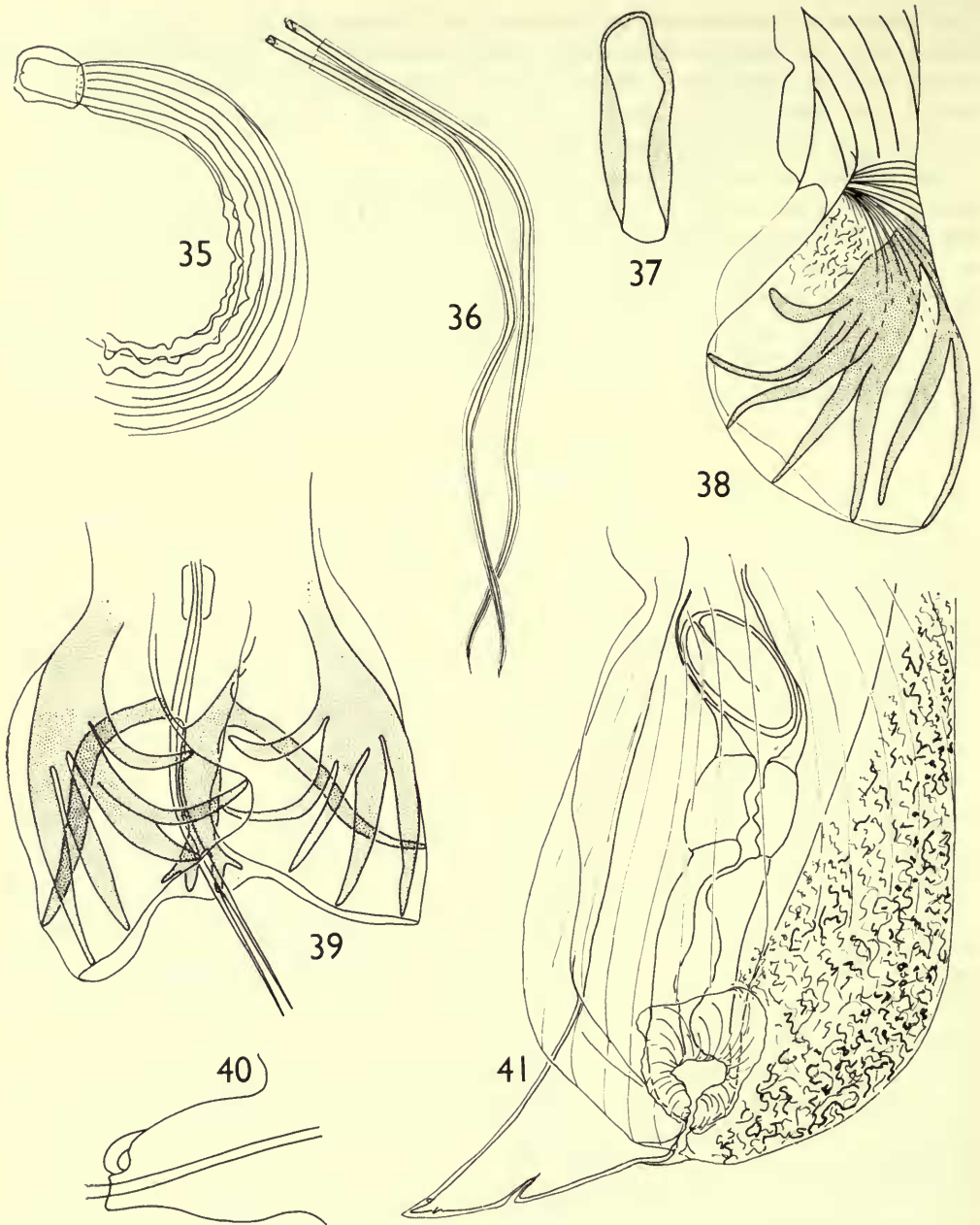
MATERIAL STUDIED. 4 ♂, 7 ♀ ex small intestine *Callosciurus maccllellandi maccllellandi*. Hatia, Arun River, East Nepal. B.M. (N.H.) Reg. Nos. 1965. 32-35.

MEASUREMENTS (in mm.). Males. Body length: 4.71; 4.97; 5.12; 5.51. Body breadth: 0.149; 0.128; 0.129; 0.137. Diameter of head: 0.027; 0.028; 0.028; 0.028. Diameter of cephalic vesicle: 0.042; 0.049; 0.055; 0.048. Length of cephalic vesicle: 0.051; 0.062; 0.055; 0.057. Oesophagus length: 0.351; 0.349; 0.367; 0.380. Length of spicules: 0.664; 0.692; 0.646; 0.661. Length of gubernaculum: 0.028; 0.034; 0.030; 0.036.

Females. Body length: 6.52; 6.73; 7.04; 7.21; 7.23; 7.32; 7.48. Body breadth: 0.120; 0.123; 0.131; 0.139; 0.129; 0.116; 0.148. Diameter of head: 0.032; 0.031; 0.030; 0.030; 0.031; 0.028; 0.039. Diameter of cephalic vesicle: 0.051; 0.050; 0.046; 0.044; 0.045; 0.049; 0.057. Length of cephalic vesicle: 0.058; 0.054; 0.055; 0.054; 0.056; 0.060; 0.058. Oesophagus length: 0.400; 0.425; 0.383; 0.373; 0.426; 0.443; 0.338. Length of tail: 0.048; 0.058; 0.050; 0.036; 0.052; 0.054; 0.057. Distance of vulva from posterior end of body: 0.121; 0.135; 0.171; 0.157; 0.168; 0.118; 0.108. Size of eggs: 0.072 × 0.044 to 0.054 × 0.032.

The body is coiled four or five times in a tight spiral. The head has the characteristic cephalic vesicle. The cuticle bears typical longitudinal ridges, twenty just posterior to the cephalic vesicle increasing to twenty-six at the mid-body region and diminishing in number posteriorly.

Male. The bursa is symmetrical and bilobed (Text-fig. 39). The ventral rays arise together from a common base as do the three lateral rays (Text-figs. 38 and 39), and all reach the edge of the bursa. The externo-dorsal rays arise close to the root of the dorsal ray but do not reach the edge of the bursa. The dorsal ray bifurcates at the extreme distal end to give two short branches which again bifurcate (Text-fig. 39). The genital cone is prominent and bears a pair of processes (Text-fig. 40)



FIGS. 35-41. *Longistriata gola* sp. nov. Fig. 35. Anterior end of female. Fig. 36. Spicules showing sheath. Fig. 37. Ventral view of gubernaculum. Fig. 38. Lateral view of male bursa. Fig. 39. Ventral view of male bursa. Fig. 40. Lateral view of genital cone showing process. Fig. 41. Lateral view of female tail showing vulvar and cuticular modification.

slightly ventral to the genital opening. The spicules are equal, long, thin, being finely pointed distally and enclosed in a sheath for most of their length (Text-fig. 36). The gubernaculum is small with the outer edges folded inwards to form a groove (Text-fig. 37).

Female. The tail is typical of the genus (Text-fig. 41), with the vulva situated just anterior to the anus. The extreme tip of the tail bears two small phasmids. The cuticle at the posterior end appears to be very loose and in some specimens completely surrounds the posterior end of the body, Mawson (1961) figures this in some detail.

DISCUSSION. Keys to the species of the genus *Longistriata* have been published by Dickmans (1935), Skrjabin, Shikhobalova & Schultz (1954) and Mawson (1961) in which the main criteria for specific separation are cuticular specialization (i.e. presence or absence of lateral alae) and the structure of the male caudal apparatus (symmetry of bursa and shape of the dorsal ray). Using these criteria more than half of the fifty-odd described species have no lateral alae and possess a symmetrical bursa as in *L. gola*. However, of these only five are similar to *L. gola* in the shape of the dorsal ray of the bursa, thus: *L. bathyergi*, *L. beta*, *L. leporis*, *L. schulzi* and *L. seurati*.

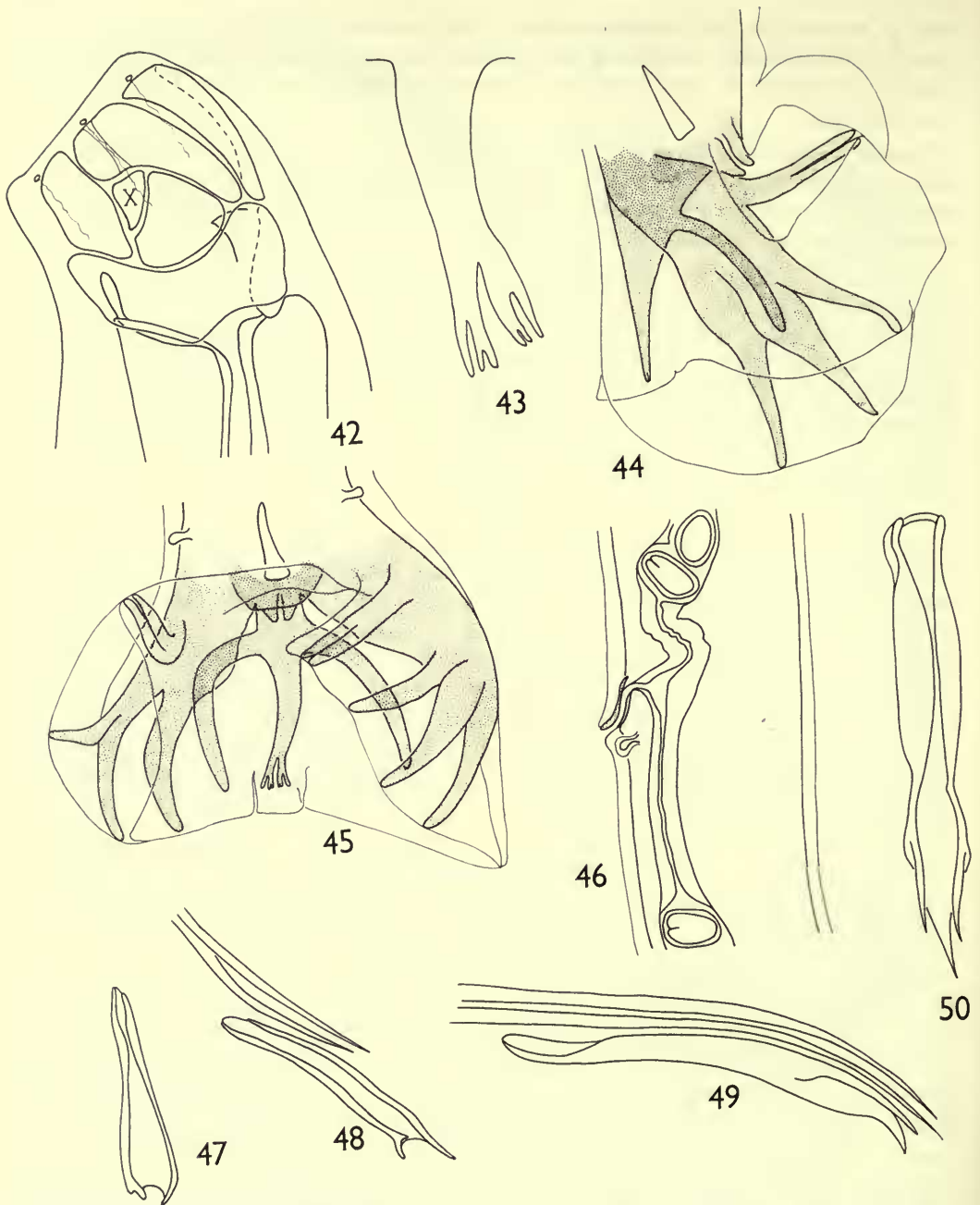
L. bathyergi Ortlepp, 1939 is similar to *L. gola* in overall size and the length of the spicules, but differs in having pre-bursal papillae, an indefinite gubernaculum, in the thickness of the dorsal rays and in the thickening at the tips of the spicules. *L. beta* (Travassos, 1918) differs in being only half the size of *L. gola*, in having smaller spicules and in the shape of the gubernaculum. *L. leporis* Schulz, 1931, and *L. schulzi* Schachnasarova, 1949 also have different spicules, those of the former being longer and distally bifurcate, whilst those of the latter are almost three times as long as those of *L. gola*. *L. seurati* Travassos & Darriba, 1929 differs in having only fourteen longitudinal ridges on the cuticle, in the spicules being united distally and in having an asymmetrical gubernaculum.

Arthrostoma tunkanati sp. nov.

MATERIAL STUDIED. 4 ♂, 7 ♀ ex small intestine. *Felis bengalensis horsfieldi*. Hatia, Arun River, East Nepal. B.M. (N.H.) Reg. Nos. 1965. 36-40.

MEASUREMENTS (in mm.). Males. Body length: 2.37; 3.23; 3.62; 3.74. Body breadth: 0.182; 0.145; 0.142; 0.163. Length of buccal cavity: 0.065; 0.074; 0.064; 0.080. Diameter of buccal cavity: 0.040; 0.061; 0.056; 0.053. Distance of excretory pore from anterior end of body: 0.327; 0.325; 0.293; 0.328. Oesophagus length: 0.438; 0.471; 0.483; 0.491. Breadth of oesophagus (maximum): 0.094; 0.068; 0.070; 0.095. Length of spicules: 0.270; 0.410; 0.383; 0.376. Length of gubernaculum: 0.054; 0.045; 0.040; 0.048.

Females. Body length: 2.46; 2.56; 2.90; 2.94; 3.85; 4.27; 4.28. Body breadth: 0.216; 0.205; 0.215; 0.211; 0.176; 0.192; 0.151. Length of buccal cavity: 0.063; 0.063; 0.070; 0.066; 0.086; 0.088; 0.074. Diameter of buccal cavity: 0.046; 0.045; 0.051; 0.045; 0.059; 0.056; 0.056. Distance of excretory pore from anterior end of body: 0.306; 0.276; 0.288; 0.308; —; 0.360; —.



FIGS. 42-48. *Arthrostoma tunkanali* sp. nov. Fig. 42. Lateral view of head, additional plate marked X. Fig. 43. Dorsal ray. Fig. 44. Lateral view of male bursa. Fig. 45. Ventral view of male bursa. Fig. 46. Lateral view of vulvar region of female showing papilla and cuticular flap. Fig. 47. Ventral view of gubernaculum. Fig. 48. Lateral view of gubernaculum and tips of spicules. Fig. 49-50. *Arthrostoma felineum*. Fig. 49. Lateral view of gubernaculum and tips of spicules. Fig. 50. Ventral view of gubernaculum.

Oesophagus length : 0.420 ; 0.503 ; 0.457 ; 0.477 ; 0.595 ; 0.567 ; 0.556. Breadth of oesophagus (maximum) : 0.094 ; 0.087 ; 0.097 ; 0.113 ; 0.102 ; 0.166 ; 0.091. Length of tail : 0.080 ; 0.086 ; 0.081 ; 0.098 ; 0.088 ; 0.083 ; 0.087. Distance of vulva from posterior end of body : 0.83 ; 0.81 ; 0.94 ; 1.01 ; 1.06 ; 1.15 ; 1.14. Size of eggs : 0.059 × 0.026 to 0.083 × 0.043.

Short narrow worms with the anterior end of the body bent dorsally. The lining of the buccal cavity is in the form of plates arranged in the same way as *Arthrostoma felineum* Cameron, 1927 but differing in the presence of an additional lateral plate (marked X in Text-fig. 42). That is, there are ten plates of which one forms a cone round the posterior of the buccal cavity, one triangular plate is ventral in position, and the remaining plates are paired, one large L-shaped pair ventro-lateral, one ovoid pair dorso-lateral and two pairs wholly lateral.

The mouth opening is ovoid without elaboration. The oesophagus is the typical club-shape.

Male : The bursa is very similar to that of *A. felineum* with prominent prebursal papillae, a distinct small dorsal lobe, small ventral rays which arise from a common base, large lateral rays which all arise from the same base. The externo-dorsal ray is markedly different from that of *A. felineum* in being narrow over its whole length and in arising some distance from the base of the dorsal ray. The dorsal ray also differs slightly in the terminal bifurcations, all of which reach the edge of the bursa (Text-figs. 43, 44 and 45). An unmodified genital cone is present.

The spicules are simple and needle-like. The gubernaculum is short, swelling slightly posteriorly where there are small ventro-lateral processes (Text-figs. 47 and 48). This is in marked contrast to the relatively larger gubernaculum of *A. felineum* in which the posterior end is sharply pointed with two lateral pointed processes (Text-figs. 49 and 50).

Female : The vulva is identical with that of *A. felineum* with a flap developed from the dorsal lip which is supported by dense cuticle (Text-fig. 46), and with a single papilla-like structure posterior and slightly lateral in position.

DISCUSSION. There are at present only two species referable to the genus *Arthrostoma*: *A. felineum* Cameron, 1927 and *A. cheni* Kou, 1958. These species are very similar but are distinguishable by the size of the spicules and the form of the gubernaculum in the males. Further the female of *A. cheni* has a wart-like projection just anterior to the vulva in addition to the usual single lateral papilla.

The species described above is similar to both those already referred to the genus but is very distinct in the additional plate in the head, in the size of the spicules and in the form of the gubernaculum.

Arthrostoma felineum Cameron, 1927

MATERIAL STUDIED. 2 ♂ ex small intestine *Felis bengalensis horsfieldi*. Hatia, Arun River, East Nepal. B.M. (N.H.) Reg. Nos. 1965. 41-42. 3 ♂, 3 ♀. Cameron's type specimens. B.M. (N.H.) 1928.9.27. 1-6.

MEASUREMENTS (in mm.). Males. Body length: 4.23; 6.01. Body breadth: 0.166; 0.182. Length of buccal cavity: 0.068; 0.073. Diameter of buccal cavity: 0.044; 0.048. Distance of excretory pore from anterior end of body: —; 0.382. Oesophagus length: 0.619; 0.620. Breadth of oesophagus (maximum): 0.108; 0.120. Length of spicules: 1.07; 1.08. Length of gubernaculum: 0.083; 0.080.

Corrected measurements of Cameron's type material:

Males: Oesophagus length: 0.359; 0.360; 0.379. Breadth of oesophagus (maximum): 0.085; 0.094; 0.073.

Females: Oesophagus length: 0.420; 0.449; 0.456. Breadth of oesophagus (maximum): 0.100; 0.097; 0.089.

The two male specimens from Nepal are in good agreement with those described by Cameron (1927), with the exception of the length of the oesophagus and the description of the spicules. As the differences in length are more than can reasonably be attributed to differences in methods of fixation, in view of the otherwise close similarity between the Nepalese material and Cameron's description, the types of *Arthrostoma felineum* were re-examined (B.M. (N.H.) Reg. Nos. 1928.9.27.1-6).

The oesophagus in both sexes is much longer than originally stated by Cameron (see above) and the spicules do not form a single fine point (Text-fig. 49), but are quite separate posteriorly. The gubernaculum is distinct (Text-fig. 50).

A. felineum has now been reported from Sumatra (Cameron, 1927), Palestine (Witenberg, 1934) and Nepal.

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